

Methods of Labor Economy Increasing in Educational Organization

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ABSTRACT

The urgency of problem under investigation due to fact that increasing demand of the information technology infrastructure development in current conditions of educational institutions functioning, including formation of the information-educational environment point of view. Offered organizational and economic model of constructing processes for software development is based on agile project management, regarded as an object-oriented tool for optimizing labor economics. The purpose of article is in model for labor economy processes optimization as a part of software development based on agile project management methodology in departments associated with development of information technologies in educational organization. The leading method to the problem study is in measurement of labor economics key indicators, including specific metrics of technical expert's human capital growth. As an experimental base of research are considered educational organizations, at different times, using classical approach for software development and agile project management. The article presents research results of educational organizations departments engaged in project activities for development of information technologies, which are in the development of software products using classical approach for software development and agile project management. Article submissions may be useful to create a culture for constructing labor economics and human capital system based on sustainable growth in departments of educational institutions working in the field of information technology.

KEYWORDS

Agile software development, human capital, informatization, labor economics, model for labor economics optimization

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Introduction

In Higher Education Informatization Concept of the Russian Federation is indicated that the strategic goal of education informatization is a global rationalization of intellectual property using digital and information

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technologies, breakthrough improve of efficiency and quality of training to a level that meets requirements of information society, both in academic circles and beyond its borders. Under the informatization of educational institutions, understands the introduction of modern information technologies and the appropriate mechanisms for their implementation, providing information support of key business processes and providing user access to relevant, current, complete, correct and consistent information (Elistratova, 2010).

In current economic, technological and administrative conditions of educational institutions informatization development as in Russia, so all other the world in line with improvement of education system all organizations faced with the task of improving balance available information technologies and continuous development of them (Karakozov, 2010). Moreover, massive integration of educational information services with single information state level systems becomes a key task for information technology departments, in terms of labor economics becomes relevant the question of software development process optimization in conditions of objectively limited level of human capital. A prerequisite for formation of labor economy effectively functioning system is in the process of building up professional activity of technical expert's human capital, including use of agile project management methodologies for software development. During creating such a system at least 70 percent of technical expert's time takes a process of iterative implementation of information systems components, this figure is achieved by not result-oriented formal requirements of software product, but due to the value-oriented end-user software requirements, so labor economics rises directly by the programming processes focusing on the real needs of individual units of the organization.

The main activity in framework of labor economic indicators optimization divisions, developing information technologies in educational organization, is the practical application of agile project management tools and policies for software development. Despite the fact that development process is based on general scientifically and practically sound patterns and algorithms, agile methodologies characterized by special attributes from the perspective of labor economics, especially in terms of determining development focus of the entire software product, each iteration, each individual task that in turn, creates a synergistic effect of reducing the time spent on planning and corrective actions of the whole process of software development. In this regard, information technology departments in educational organization have a multi-component problem of determining the optimum time and targeted use of resources in case of technical experts human capital, provided by current trends of input information systems in pilot usage clearly indicate the need for rapid development processes formation with minimal features, ensuring satisfaction of the primary needs of users. It should be noted that previously used classical methods of development does not meet the needs of present time to effectively practice labor economics and develop human capital system of the technicians, in particular key indicators measuring level of labor economics efficiency during using agile software development becomes the time spent on implementation of specific tasks, as well as the speed of solving typical problems, and average speed of a single development team spent on the project, iteration or task unit. Increased attention to the problem of software products implementation speed increasing within educational organization in a time of scarce resources and human capital is a natural and objective need for the education system as a whole.



In accordance with, generally accepted international conceptual apparatus under agile methodology understands a series of approaches to software development oriented on use of iterations, dynamic formation of requirements and ensuring their implementation because of constant interaction within the self-organizing working groups, consisting of experts in various fields. There are several techniques related to the class of agile methodologies, such as extreme and pair programming, dynamic systems development method, development method based on functionality control. Using effective practice of organizing small work groups in association with the management of the combined (liberal and democratic) method.

Most agile methodologies are aimed to minimize of labor routine operations and information risk by developing a series of short cycles called iterations, which typically last from two to three weeks. Each iteration in itself looks like a miniature software project and includes all tasks required for the issue of the mini-increment functionality. Although a separate iteration, as a rule, is not sufficient to release the new version of the product, it is understood that agile software project ready for release at the end of each iteration. At the end of each iteration, team performs a re-evaluation of development priorities. Agile methods focus on direct face-to-face communication. Most of these commands are located in same office. Minimally it includes "customer" - plenipotentiaries, defining requirements for the software product; this role can perform project manager, business analyst, or an internal customer.

Conceptual directions and regulations of labor economics in organization examined by T.V. Smirnova (2010), R.M. Kamaltdinova (2010), Y.V. Latov (2011) and others. Some aspects of the human capital development as a component of labor economics associated with the use of innovative approaches to implementation of key particular department or organization processes represented in works of V.G. Chumak & O.A. Gorbunova (2009), S.I. Ashmarina et al. (2016) and others.

Thus, the stated problem is an actual study, research and practice-oriented. Its decision is consistent with the strategic guidelines of the state policy, reflected in the "Informatization of the Russian Federation Higher Education Concepts".

Materials and Methods

Research methods

During research the following methods were used: theoretical (methods of system analysis, synthesis, modeling); diagnostic (questionnaires, tests); empirical (experience learning units, developing information technology in educational organization on the basis of classical and agile software development, design of labor economic indicators; search for best practices implementation of human capital development tools); experimental (notes forming, control experiments); methods of mathematical statistics and graphic results.

Experimental research base

Experimental research base is the Russian State Vocational Pedagogical University, Ekaterinburg, Russia, and Center for Business Education, Ekaterinburg, Russia. The study involved employees of relevant departments,

developing information technology in educational organizations. The overall composition of the technical experts in functional areas: "Developer" (specialization - web development), "Developer" (specialization - software development), "Systems analyst", "Tester", "HTML-coder," "System administrator" "Technical Director" in total amount of 107 people.

Stages of research

Research was conducted in three phases:

During first stage scientific-theoretical, organizational and economical, project cases and methodological sources of information on this problem were analyzed; specifics of technical experts economic activities during develop software products were analyzed, refined the basic directions of research;

During second stage temporal and economic aspects of software development in educational organization using classical and agile development were examined; determined by collective and personal influence on improvement of the labor economy by using classical and agile development methodologies to the specific example implementation of information systems; develop policies and model of the labor economics process optimization and human resource management system using agile software development;

During third stage processing of the results was carried out, carried out design and feasibility study complete transition of the educational organization to use agile project management for software development, formulated conclusions were made out of the study.

Results

Research results

Actual result of study was the policy in field of occupational educational institutions economy for specialized departments that are in process of software development. The above policy is based on basic concepts of labor economics - factors to save time and human resources components due to human capital management, the overall economic impact.

The conceptual basic policy in the field of occupational educational institutions economy for specialized departments that are in the process of software development introduce agile tools of project management methodology for software development. Policy aimed to form a model of labor economics and human resource management system by the forming optimization processes using agile software development. The key components in formation of economic effects are scripting user behavior on part of domestic consumers, decomposition behavior during development of problem scenarios, reducing cycle software development for short iterations (usually two to four weeks), followed by the launch of a specific part of the developed product functionality in trial operation according to the user scenario.

Description of the user behavior scenarios from the inner consumer provides the sequence of formation unified requirements from future users. From perspective of labor economics, this component reduces the time required for formation of technical specifications, which ceteris paribus will be appreciated by development team, but will not generate the real needs of users due to the complex language and terms used by developers in description of terms.



Decomposition of user behavior scenarios from side of development team also optimizes the process of requirements formation. Factor of timesaving generated by the substantive work of technicians with a specific set of user requirements, which in turn are decomposed into separate tasks to create a software product or part of the solution architecture.

Use short iterations in development of software defines purpose and functional purpose of a particular module, namely in the framework of a working iteration developed a software solution that provides the implementation of system requirements particular on the part of users. In addition, the factor of labor is taken into account housekeeper reduction of total number of adjustments and improvements of software due to rapid feedback on product from users. This component is directly connected with the other two components of model creation and provides labor saving effect. This component involves designing software scheme Agile development "requirements - working product - product refinement," which in turn is opposed to the classical model of development "terms of reference - a pilot run - error correction - a product launch in the work".

Stages of model implementation

The introduction of this model suggests the next stage of design and experimental work:

- Determination of labor economic baseline indicators in departments responsible for the development of information technology in educational organization, using testing methods, questionnaires, mathematical statistics and analytical processing of the survey results.
- Development and implementation of scientific and methodological support, contributing to successful functioning of the structural-functional model due to formation of labor economics and human resource management system processes.
- Determination of dynamics level while using agile software development.

Establishing step

During research employees of relevant departments, developing information technologies in educational institutions were involved. The overall composition of the technical experts in functional areas: "Developer" (specialization - web development), "Developer" (specialization - software development), "Systems analyst", "Tester", "HTML-coder," "System administrator" "Technical Director" in total amount of 107 employees. Analysis of the results in terms of labor economics led to conclusion that using agile development methodology of management software products level of technician's human capital grew by 21%, a number of solved problems, speed of their solutions, and the number of errors in the code characterize this figure.

Results of establishing stage in case of design and experimental work with developers of IT department (web development) from educational institutions are presented in Table 1, 2.

Table 1. Performance of developers work on a standard project implementation (web development), "Russian State Vocational Pedagogical University".

Employees Group	Quantity (pcs.)	Average rate of labor economics	Development Methodology	Initial data	Error	Dynamic for 2015	Growth (%)
Developers (web development)	8 people	Completed tasks on a standard project in a month (units).	Classic	52 task	1 unit	+ 2 tasks	+ 4 %
			Agile	61 task	3 units	+ 15 tasks	+ 30 %
		rate of solving typical problems (Pers. / Hour)	Classic	2 hours	0,5 hour	2 hours	0%
			Agile	1,5 hours	0,5 hour	1 hour	- 33,3%
		Number of tasks on a system corrective (units).	Classic	48 tasks	4 tasks	42 tasks	- 10%
			Agile	21 tasks	3 tasks	15 tasks	- 27%
Synergistic effect of labor economics increasing rates							
Saves working time compared to the classical development methodology (hour / month.)		22 hours / month. per technician 176 hours / month. in the web development department	Economic effect of agile development use (rub. / month.)		8470 rub. / Month. per technician 6770 rub. / Month. in the web development department Total for the year: 812 400 rubles.		

Table 2. Performance of developers work on a standard project implementation (web development), "Center of Business Education".

Employees Group	Quantity (pcs.)	Average rate of labor economics	Development Methodology	Initial data	Error	Dynamic for 2015	Growth (%)
Developers (web development)	14 people	Completed tasks on a standard project in a month (units).	Classic	64 task	1 unit	+ 5 tasks	+ 12 %
			Agile	81 task	3 units	+ 32 tasks	+ 41 %
		rate of solving typical problems (Pers. / Hour)	Classic	2 hours	0,5 hour	2 hours	0%
			Agile	1,5 hours	0,5 hour	1 hour	- 33,3%



	Number of tasks on a system corrective (units).	Classic	59 tasks	5 tasks	52 tasks	- 12%
		Agile	27 tasks	3 tasks	19 tasks	- 30%
Synergistic effect of labor economics increasing rates						
Saves working time compared to the classical development methodology (hour / month.)	44 hours / month. per technician	Economic effect of agile development use (rub. / month.)	19800 rub. / Month. per technician			
	616 hours / month. in the web development department		277200 rub. / Month. in the web development department			
			Total for the year:			
			3,326,400 rubles			

Thus, correction seems as appropriate process of software development in educational institutions, namely in terms of adjustment methodologies used in software development with a gradual transition from the classical model to agile software development. In addition, there is an analysis of indicators for other groups of employees of departments that develop software products for educational institutions in order to calculate the total effect of the introduction of laborsaving economy policies across all departments using flexible management methodology development of software products.

Forming step

The formative phase of design and experimental work with developers department of educational institutions intended to solve the following problems:

- forming system of knowledge and skills in managing development of software products using agile methodology in developers department of educational institutions;
- development of professionally important qualities in programming as a factor of human capital as for individual employee, and for a whole department.

Research process was implemented at the sites of Russian State Vocational Pedagogical University" (Ekaterinburg) and "Center of Business Education" (Ekaterinburg), by forming processes of labor economics and human resource management optimization.

Control step

Analysis of labor economics and human resource management system in educational institutions after introduction agile project management methodology of software development leads to the following conclusions:

- the number of implemented (standard project) tasks, increased from 30% to 41%;
- the rate of solving typical problems increased by 33.3%;
- the number of problems to correct the system reduced from 27% to 30%;
- the general term of software development decreased by 18% on average.

Results of the analysis show a positive trend in the level of labor economics and human resource management system in educational institutions after introduction of agile project management methodology.

Discussions

To date, one of priorities of the state policy in a field of education is becoming a massive informatization for all educational institutions. This implies a system of organization and development for effective management of software development, including from labor economics and the organization of human capital development systems point of view. This fact establishes O.V. Isaeva, O.S. Bezuglyak & S.V. Shapovalova (2016), N.K. Kakabadse, C. Rozuel & L. Lee-Davis (2005), I.S. Lozovaya (2010), T.A. Vasilenko (2011), B.D. Darizhapov (2002), S.V. Forrester et al. (2016), E.M. Dorozhkin et al. (2016).

Study of Economic Literature A.T. Zoob (2014), V.N. Funtov (2011), A.A. Faskhiev (2009), I.Y. Volostnikov (2009), E.P. Troshina et al. (2016) allows to conclude the absence of specific studies of the basic principles and policies for optimizing working processes of economy as part of agile project management methodology in departments associated with development of information technologies in educational organization.

Research of labor economics features and content in organizations indicated that work on implementation of tools that increase the baseline economics of labor and human capital, has a significant impact on organization efficiency as a whole. In the works of N.R. Hadasevich (2015), A.A. Kogdin (2012), J.C. Bagirov (2011) noted that organizations collaboration in internal and external labor market is a key factor in the development of human capital during the processes of labor potential formation.

Today, the heads of departments related to development of information technologies, acute problem of time and human resources shortage at the stage of development, implementation and maintenance of information systems. Thus, changes in the process of software development should be reflected in the performance of labor economics (Anoshin 2013; Nikulina, 2011; Lipaev, 2011).

In addition, theoretical analysis and experience of educational institutions for economy improvement showed that usage of non-standard approaches in project activity has a number of other positive aspects: increased productivity and labor economics within individual departments and workgroups, increased implementation speed for model decisions by project teams involvement in employment, growth in non-economic motivation of individual departments using non-standard approaches in the work.

Conclusion

It's established that the general trend in the development of informatization of the educational organization will be successful, if the formation of the relevant professional communities within the dedicated units are organized as a purposeful and deliberate process, which are carried out on the basis of modern models of perfection of labor economics, consisting of interrelated components. The key components in the formation of the economic effects are formation scenarios of user's behavior on the part of internal consumers, decomposition behavior scenarios for the development of the tasks, reducing the cycle of the software development for short iterations (usually two to four weeks) followed by



the launch of a specific part of the functions of the developed product in trial operation according to the user scenario.

This article may be useful for studying in educational institutions of higher education on economic direction, for experts in the field of information technology, who focus on the use of advanced methods of project management software development.

Disclosure statement

No potential conflict of interest was reported by the authors.

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